Contribution ID: **340** Type: **Poster**

Current status of gross α/β activity analysis in water samples: A short overview of methods

Thursday, 22 April 2010 12:00 (20 minutes)

In the last few decades, increasing attention is paid to restrict exposure of the public to the naturally occurring radiation. The WHO (WHO, 2004) and the EU Council (EC, 1998; EC, 2010-in preparation) have determined the reference level of the effective dose received from drinking water consumption at 100 mu;Sv y⁻¹. This value excludes the dose received from ³H, ⁴⁰K, ²²²Rn, and radon decay products, but it includes the other alpha;- and beta;-emitting radionuclides.
In general, gross alpha;–beta; analysis is used as the first step of the radiological characterization of drinking waters as a screening method. Its main advantages are the relatively low costs, simplicity, and stability. In the third edition of WHO guidelines for drinking water quality (WHO, 2004) the recommended levels are 0.5 Bq L⁻¹ for gross alpha; and 1 Bq L⁻¹ for gross beta; activities, respectively. If the measured values are below the reference levels of gross activity, the drinking water examined is acceptable for human consumption without any further action with respect to its radioactivity. Otherwise, nuclide specific analysis is required to determine the radionuclide content using more sophisticated, more expensive and time-consuming procedures.
Due to the uncertainties of gross alpha; and beta; measurements this method is often the subject of discussions and debates. The aim of this work is to collect information about recently used standard and routine methods concerning gross alpha; and beta; activity determination in drinking waters in order to evaluate their possibilities. Sample preparation methods –e.g. evaporation, co-precipitation –and detection systems –e.g. gas flow proportional counting, liquid scintillation counting and scintillation counting –are compared on the ground of literature data. In the course of our work, the following parameters were analyzed: background, counting efficiency, interferences, sample capacity, minimal detectable activity, typical counting time, time demand of sample preparation.
On one hand, the paper gives an overview of the recently used techniques and, on the other hand, tries to help finding a suitable gross alpha;-beta; radioanalytical tool adapted to the laboratory's demands. This work is part of our effort to develop a reliable method to determine reference values for gross alpha; and beta; activity in water samples to be used for an interlaboratory comparison between EU monitoring laboratories in the near future.

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Session Classification: Poster Session - Radionuclides in the Environment, Radioecology 2

Track Classification: Radionuclides in the Environment, Radioecology